INTERNATIONAL STANDARD

ISO

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Linear calibration using reference materials

Étalonnage linéaire utilisant des matériaux de référence

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11095 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 6, *Measurement methods and results*.

Annexes A and B form an integral part of this International Standard. Annex C is for information only.

Introduction

Calibration is an essential part of most measurement procedures. It is a set of operations which establish, under specified conditions, the relationship between values indicated by a measurement system and the corresponding accepted values of some "standards". In this International Standard, the standards are reference materials.

A reference material (RM) is a substance or an artifact for which one or more properties are established sufficiently well to validate a measurement system. There exist several kinds of RMs:

a) an internal reference material is an RM developed by a user for his/her own internal use;

b) an external reference material is an RM provided by someone other than the user;

c) a certified reference material is an RM issued and certified by an organization recognized as competent to do so.

Linear calibration using reference materials

1 Scope

This International Standard:

a) outlines the general principles needed to calibrate a measurement system and to maintain that "calibrated" measurement system in a state of statistical control;

b) provides a basic method

— for estimating a linear calibration function under either one of two assumptions relating to the variability of the measurements,

— for checking the assumption of linearity of the calibration function and the assumptions on the variability of the measurements, and

— for estimating the value of a new unknown quantity by transforming the measured values obtained on that quantity with the calibration function;

c) provides a control method for extended use of a calibration function

— for detecting when the calibration function needs to be updated, and

— for estimating the uncertainty of the measured values after transformation with the calibration function;

d) provides two alternatives to the basic method under special conditions;

e) illustrates the basic method and the control method with an example.

This International Standard is applicable to measurement systems for which reference materials are available.

It is applicable to measurement systems with an assumed linear calibration function. It offers a method for examining the assumption of linearity. If it is known that the calibration function is nonlinear, then this International Standard is not applicable unless one uses the "bracketing technique" described in 8.3.

This International Standard does not make a distinction among the various types of RMs and considers that the accepted values of the RMs selected to calibrate the measurement system are without error.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3534-1:1993, *Statistics — Vocabulary and symbols — Part 1: Probability and general statistical terms.*

ISO 3534-2:1993, *Statistics — Vocabulary and symbols — Part 2: Statistical quality control.*

ISO Guide 30:1992, *Terms and definitions used in connection with reference materials.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 3534-1 and ISO 3534-2 and the following definition apply.

3.1 reference material: A substance or an artifact for which one or more properties are established suf-